Scoping Assessment on Climate Change Adaptation in Bangladesh

Summary

October 2010

ADAPTATION KNOWLEDGE PLATFORM

REGIONAL CLIMATE CHANGE ADAPTATIONKNOWLEDGEPLATFORM for Asia

Acknowledgements

The Scoping Assessment on Climate Change Adaptation in Bangladesh-Summary was conducted and written in early 2010.

This scoping study of climate change in Bangladesh draws on work in progress related to the Adaptation Knowledge Platform to disseminate and exchange adaptation knowledge with a wider audience. We thank the countless institutions, organizations, and individuals that have provided key inputs and their insights. The report greatly benefited from comments and suggestions to report the state of climate change adaptation in Bangladesh.

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Bangkok, Thailand
October 2010

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ABBREVIATIONS & ACRONYMS

ADB	ASIAN DEVELOPMENT BANK
AIT	ASIAN INSTITUTE OF TECHNOLOGY
AIT-UNEP RRC.AP	ASIAN INSTITUTE OF TECHNOLOGY/UNITED NATIONS ENVIRONMENT PROGRAMME REGIONAL RESOURCE CENTRE FOR ASIA AND THE PACIFIC
AP	ADVISORY PANEL
ASEAN	ASSOCIATION OF SOUTHEAST ASIAN NATIONS
BCAS	BANGLADESH CENTRE FOR ADVANCED STUDIES
BCCSAP	BANGLADESH CLIMATE CHANGE STRATEGY AND ACTION PLAN
BMA	BANGKOK METROPOLITAN ADMINISTRATION
CCA	CLIMATE CHANGE ADAPTATION
CCAI	CLIMATE CHANGE ADAPTATION INITIATIVE
CEGIS	CENTRE FOR ENVIRONMENTAL AND GEOGRAPHICAL INFORMATION SYSTEMS
COP	UNITED NATIONS CLIMATE CHANGE CONFERENCE IN COPENHAGEN
CSR	CORPORATE SOCIAL RESPONSIBILITY
DDPM	DEPARTMENT OF DISASTER PREVENTION AND MITIGATION
DRR	DISASTER RISK REDUCTION
DWR	DEPARTMENT OF WATER RESOURCES
GCCA	GLOBAL CLIMATE CHANGE ALLIANCE
GEF	GLOBAL ENVIRONMENT FACILITY
GOV	GOVERNMENT
GTZ	GERMAN AGENCY FOR TECHNICAL COOPERATION
EKH	ENVIRONMENTAL KNOWLEDGE HUB
EU	EUROPEAN UNION
HMS	HYDRO-METEOROLOGICAL SERVICE
ICCCAD	INTERNATIONAL CENTRE FOR CLIMATE CHANGE AND DEVELOPMENT
ICT	INFORMATION AND COMMUNICATION TECHNOLOGIES
IGES	INSTITUTE FOR GLOBAL ENVIRONMENTAL STRATEGIES
IIED	INTERNATIONAL INSTITUTE FOR ENVIRONMENT AND DEVELOPMENT
INGO	INTERNATIONAL NON-GOVERNMENTAL ORGANIZATION
ISET-N	INSTITUTE FOR SOCIAL AND ENVIRONMENTAL TRANSITIONS–NEPAL
IT	INFORMATION TECHNOLOGY
IUCN	INTERNATIONAL UNION FOR CONSERVATION OF NATURE
IWRM	INTEGRATED WATER RESOURCES MANAGEMENT
KP	KYOTO PROTOCOL
LDC	LEAST DEVELOPED COUNTRIES
MARD	MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT

MOEF	MINISTRY OF ENVIRONMENT AND FOREST
MMF	MANGROVES FOR THE FUTURE
MONRE	MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT
MOST	MINISTRY OF SCIENCE AND TECHNOLOGY
MPI	MINISTRY OF PLANNING AND INVESTMENT
MRC	MEKONG RIVER COMMISSION
NAPA	NATIONAL ADAPTATION PLAN OF ACTION
NCS	NATIONAL COMMUNICATIONS
NDWC	NATIONAL DISASTER WARNING CENTRE
NEA	NATIONAL ENVIRONMENT AGENCY
NGO	NON-GOVERNMENTAL ORGANIZATION
NISTPASS	NATIONAL INSTITUTE FOR SCIENCE AND TECHNOLOGY POLICY AND STRATEGY STUDIES
NOCCOP	NATIONAL OFFICE FOR CLIMATE CHANGE AND OZONE PROTECTION
NSEP	NATIONAL STRATEGY FOR ENVIRONMENTAL PROTECTION
NTP	NATIONAL TARGET PROGRAM
NWP	NAIROBI WORK PROGRAMME
ONEP	OFFICE OF NATURAL RESOURCES AND ENVIRONMENTAL POLICY AND PLANNING
OVI	OBJECTIVELY VERIFIABLE INDICATOR
PPCR	PILOT PROGRAMME FOR CLIMATE RESILIENCE
SAARC	SOUTH ASIAN ASSOCIATION FOR REGIONAL COOPERATION
SEA START	SOUTHEAST ASIA SYSTEM FOR ANALYSIS, RESEARCH AND TRAINING
SEI	STOCKHOLM ENVIRONMENT INSTITUTE
SENSA	SWEDISH ENVIRONMENTAL SECRETARIAT FOR ASIA
SIDA	SWEDISH INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
TEI	THAILAND ENVIRONMENT INSTITUTE
TOR	TERMS OF REFERENCE
UK	UNITED KINGDOM
UKCDS	UK COLLABORATIVE ON DEVELOPMENT SCIENCES
UN	UNITED NATIONS
UNDP	UNITED NATIONS DEVELOPMENT PROGRAMME
UNEP ROAP	UNITED NATIONS ENVIRONMENT PROGRAMME REGIONAL OFFICE FOR THE ASIA AND PACIFIC
UNFCC	UN FRAMEWORK CONVENTION ON CLIMATE CHANGE
UNISDR	UNITED NATIONS INTERNATIONAL STRATEGY FOR DISASTER REDUCTION
USA	UNITED STATES OF AMERICA
WWF	WORLD WILDLIFE FUND

EXECUTIVE SUMMARY

The Regional Climate Change Adaptation Knowledge Platform for Asia (hereinafter, referred to as the Adaptation Knowledge Platform) has been developed to respond to demand for effective mechanisms for sharing information on climate change adaptation and developing adaptive capacities in Asian countries, many of whom are the most vulnerable to the effects of climate change. The Adaptation Knowledge Platform supports research and capacity building, policy making and information sharing to help countries in Asia adapt to the challenges of climate change. The Adaptation Knowledge Platform will facilitate climate change adaptation at local, national and regional levels to strengthen adaptive capacity of countries in the region – while working with existing and emerging networks and initiatives.

Through its work the Adaptation Knowledge Platform is working towards building bridges between current knowledge on adaptation to climate change and the governments, agencies and communities that need this knowledge to inform their responses to the challenges that climate change presents to them. This is reflected in the **Platform Goal**, which is to facilitate climate change adaptation in Asia at local, national and regional levels and strengthen adaptive capacity [see Annex 1 for Phase One - Logical Framework (2009-2011)].

The specific **Purpose** of the Adaptation Knowledge Platform is to establish a regionally and nationally owned mechanism that facilitates the integration of climate change adaptation into national and regional economic and development policies, processes and plans, strengthens linkages between adaptation and the sustainable development agenda in the region and enhances institutional and research capacity.

In order to achieve this purpose, the Adaptation Knowledge Platform will bring together policy-makers, adaptation researchers, practitioners, and business leaders and will work through a range of activities to achieve three components:

a. **Regional knowledge sharing system:** a regionally and nationally owned mechanism to promote dialogue and improve the exchange of knowledge, information and methods within and between countries on climate change adaptation and to link existing and emerging networks and initiatives.
b. **Generation of new knowledge:** to facilitate the generation of new climate change adaptation knowledge promoting understanding and providing guidance relevant to the development and implementation of national and regional climate change adaptation policy, plans and processes focused on climate change adaptation.
c. **Application of existing and new knowledge:** synthesis of existing and new climate change adaptation knowledge to facilitate its application in sustainable development practices at the local, national and regional levels.

In collaboration with a wide range of national and regional partners, the Adaptation Knowledge Platform will aim at establishing a regionally and nationally owned information exchange mechanism that facilitates the integration of climate change adaptation into national and regional economic and development policies, processes and plans, strengthening linkages with the development agenda and enhancing research and institutional capacity.

The need for such an initiative is clear: the form it should take, less so. The initial partners in the Adaptation Knowledge Platform (Stockholm Environment Institute (SEI), Asian Institute for Technology/United Nations Environment Programme Regional Resource Centre for Asia and the Pacific (AIT-UNEPRRC.AP) and UNEP Regional Office for Asia and the Pacific (UNEP ROAP), supported by the Swedish Environmental Secretariat for Asia (SENSA) consequently agreed that the initial stages of the Platform's development, during 2009, should be an inception phase during which the management and implementation modalities were established, contacts with and the ownership of stakeholders at both national and regional levels were developed, needs for knowledge generation and sharing and capacity building were assessed and plans for the implementation of the Adaptation Knowledge Platform in 2010-2011 were prepared.

Overall, the activities implemented in 2009 achieved these aims. Activities have been initiated in the five pilot countries, Bangladesh, Cambodia, Nepal, Thailand and Viet Nam, with local partner's mobilized and key knowledge and capacity gaps identified. The management arrangements for the long-term development of the Platform are in place and the structure of the regional knowledge sharing mechanism has been defined. Effective communications are initiated, leading to awareness of the Adaptation Knowledge Platform's development that culminated in its successful, high profile launch on October 3rd 2009 together with the Asia Pacific Climate Change Adaptation Network (hereinafter, referred to as the Adaptation Network). Capacity development activities include training for officials and researchers from across the region and substantial progress has been made in the inventorying of existing and generation of new knowledge products. Sharing of knowledge on climate change adaptation has been initiated, focusing on the impacts of climate change on high altitude ecosystems. Linkages and collaboration with other relevant initiatives has been initiated, with the agreement reached with the Asia Pacific Adaptation Network and the Southeast Asia Network of Climate Change Focal Points for delivery of country needs on climate change adaptation in South and South-East Asia.

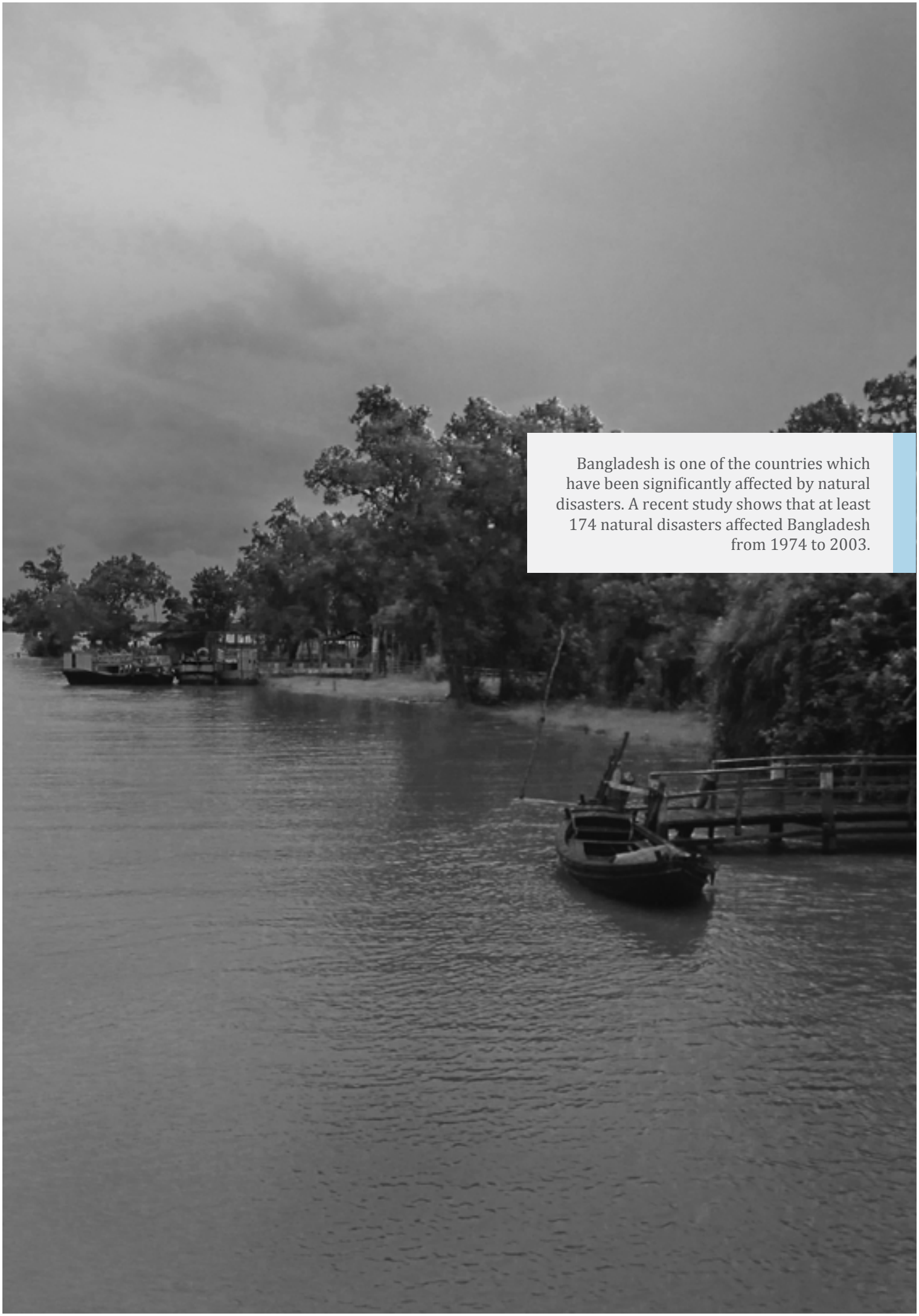
The most significant outcome of the inception year is the strategy for the future development of the Adaptation Knowledge Platform, presented in this report. The strategy details the activities that will be undertaken for each of the three components identified in the programme framework, along with a number of specific communications activities. These three components, along with the main focus of planned activities, are:

Regional knowledge sharing system: a regionally and nationally owned mechanism to promote dialogue and improve the exchange of knowledge, information and methods within and between countries on climate change adaptation and to link existing and emerging networks and initiatives. This will include the development of a Platform website and communications products to reach stakeholders across the region, an annual Asian Climate Change Adaptation Forum, a number of training and capacity development activities, the synthesis and dissemination of information and global experiences on adaptation actions and the development of national-level knowledge sharing and capacity development activities.

Generation of new knowledge: to facilitate the generation of new climate change adaptation knowledge promoting understanding and providing guidance relevant to the development and implementation of national and regional climate change adaptation policy, plans and processes focused on climate change adaptation. This will include the development of generic knowledge products, focused on the analysis of resilience and vulnerability, understanding the links between disaster risk reduction and climate change adaptation and downscaling of climate change and impact assessment data. It will also include four new studies that address key gaps in knowledge and understanding for the mainstreaming of adaptation into development planning. These four studies are: (i) Understanding Planning; (ii) Perceived and Actual Knowledge Gaps; (iii) Comparing Adaptation and Development; and (iv) How 'Autonomous' are Autonomous Responses?

Application of existing and new knowledge: synthesis of existing and new climate change adaptation knowledge to facilitate its application in sustainable development practices at the local, national and regional levels. The focus here is where knowledge is applied: within the countries of the region through mainstreaming adaptation into development planning. Follow-up activities are planned for the five pilot countries listed above and, in addition, in 2010 and 2011 the Adaptation Knowledge Platform activities will be initiated in the remaining eight focal countries: Bhutan, Sri Lanka, China, the Philippines, Myanmar, Indonesia, Lao PDR and Malaysia. In all of these countries, the Adaptation Knowledge Platform will work through partnerships with local institutions and 30% of the budget for 2010-2011 will be dedicated to these partners. There will also be activities to develop generic knowledge-to-practice products at the regional level.

Together with the dedicated **communications** activities, these components will achieve the objectives of this phase of the Regional Climate Change Adaptation Knowledge Platform for Asia. They will also build a base for the long-term development of the Platform as a knowledge-based, demand-driven structure through which planning for and capacities to address climate change adaptation as a core challenge for the future development of Asia. It is anticipated that this legacy will be carried forward through new phases of the Adaptation Knowledge Platform if and when there is demand for the services the Platform provides from the countries of Asia.



Bangladesh is one of the countries which have been significantly affected by natural disasters. A recent study shows that at least 174 natural disasters affected Bangladesh from 1974 to 2003.

Photo credit: AIT-UNEP RRC.AP/Roopa Rakshit

SCOPING ASSESSMENT ON CLIMATE CHANGE ADAPTATION IN BANGLADESH

INTRODUCTION

Climate change related impacts including flood, drought, sea level rise, salinity, temperature and rainfall variations etc have become major concern for most countries of the world due to its long-term implications and adverse effects on development activities. Although both the developed and developing countries are being affected, the developing and underdeveloped countries are most vulnerable to climate change and climate variability due to its direct impact on economic, social and development sectors. It has further put additional pressure on the limited natural resources like water, land and biodiversity.

Bangladesh is one of the countries which have been significantly affected by natural disasters. A recent study shows that at least 174 natural disasters affected Bangladesh from 1974 to 2003 (Sapir et al, 2004). Extreme events such as floods, drought and cyclone etc directly and indirectly affect life and livelihood of people of this country almost every year. For example, the total death caused by flood in 2004 was about 800 while cyclone of 1991 killed 138,000 people of Bangladesh (ADB, 2004; BCAS, 1991).

The Stockholm Environment Institute (SEI) in association with the Swedish Environment Secretariat for Asia (SENSA), the United Nations Environment Programme (UNEP) and the Asian Institute of Technology (AIT) – UNEP Regional Resource Centre for Asia and the Pacific (RRC.AP) initiated a Regional Climate Change Adaptation Knowledge Platform for Asia (or Adaptation Platform) to facilitate climate change adaptation at local, national and regional levels and to strengthen adaptive capacity of South and South East Asian countries.

Bangladesh Centre for Advanced Studies (BCAS) has been identified as national implementation partner in Bangladesh to support the process at the country level. BCAS as part of the initial task has done policy and institutional assessment, identification of research priorities and capacity needs assessment etc to facilitate the platform activity.

OBJECTIVE AND METHODOLOGY

The objective of the study is to facilitate the regional adaptation platform providing the initial assessment of country policy and strategy, research priorities and capacity needs.

A number of climate change related documents (national and international) and relevant policies were collected from concerned local, national, regional and international sources. These were reviewed accordingly to prepare the required outputs. A small team of BCAS had series of internal consultations among the climate change group to meet the requirement of the study.

POLICY AND INSTITUTIONAL SCOPING ASSESSMENT

Bangladesh is a party to various international environmental conventions, including the UNFCCC, UNCCD, UNCBD and the RAMSAR Convention on Wetlands. Bangladesh submitted its first National Communications to the UNFCCC in late 2002 and the second National Communication is under preparation.

With regard to UNCBD, Bangladesh has not yet submitted a national biodiversity strategy and action plan (NBSAP). A report on alien species does not touch upon climate related issues. Bangladesh has also produced a National Planning Tool for the implementation of the Ramsar Convention on wetlands that draws linkages between Ramsar and biodiversity issues, but not with climate change concerns. Similarly, the country's documentation for the World Summit on Sustainable Development only discusses climate change as a stand-alone air quality issue, rather than a cross-cutting concern affecting many aspects of sustainable development. However, the government of Bangladesh has made substantial progress (after 2005) in terms policy and institutional mechanism to address climate change and adaptation. The following sections provide overall picture of policy and institutional mechanism on climate change:

Existing policies, institutional mechanisms and mandates and specific programmes for adaptation, national development and key sectors

The National Adaptation Programme of Action (NAPA) for Bangladesh was prepared following the generic guiding principles outlines by the LDC Expert Group (LEG); by the Ministry of Environment and Forest (MoEF) as a response to the decision taken at the UNFCCC's Seventh Session Conference of Parties (COP7). The NAPA aimed to draw upon the understanding of the current state of affairs as gathered from discussions with relevant stakeholders from four sub-national workshops and one national workshop (MoEF, 2005). It identifies the immediate and urgent needs of the country in regard to adaptation activities and has listed priority activities (BCAS, 2008). The NAPA was prepared keeping in mind the sustainable development goals and objectives of Bangladesh where the importance of addressing environmental issues and natural resource management with the participation of stakeholders in bargaining over resource use, allocation and distribution was recognized (BCAS, 2008). Involving key stakeholders was an integral part of the preparation process for assessing impacts, vulnerabilities and adaptation measures. Policy makers, local representatives of the Government (Union Parishad Chairman and Members), scientific community members of the various research institutes, researchers, academicians, teachers (ranging from primary to tertiary levels), lawyers, doctors, ethnic groups, media, NGO and CBO representatives and indigenous women contributed to the development of the NAPA for Bangladesh. Working groups and

sectoral reports were created covering a wide range of vulnerability profile and adaptation options in areas of (Tanner et. al, 2007:22):

- Water, Coastal Areas, Natural Disaster and Health
- Agriculture, Fisheries and Livestock
- Biodiversity, Forestry and Land use
- Industry and Infrastructure
- Food Security, Livelihood, Gender and Local Governance
- Policies and Institutes

However, the NAPA only suggests future adaptation strategies to deal with the effects of climate change. Based on these strategies a list of priority activities were outlined, none of which have been implemented till now due to disputes over funding.

The NAPA suggested the following adaptation measures for Bangladesh to address adverse effects of climate change including variability and extreme events based on existing coping mechanisms and practices. The suggested future adaptation strategies are (MOEF 2005):

1. Reduction of climate change hazards through coastal afforestation with community participation.
2. Providing drinking water to coastal communities to combat enhanced salinity due to sea level rise.
3. Capacity building for integrating climate change in planning, designing of infrastructure, conflict management and land water zoning for water management institutions.
4. Climate change and adaptation information dissemination to vulnerable community for emergency preparedness measures and awareness raising on enhanced climatic disasters.
5. Construction of flood shelter, and information and assistance centre to cope with enhanced recurrent floods in major floodplains.
6. Mainstreaming adaptation to climate change into policies and programmes in different sectors (focusing on disaster management, water, agriculture, health and industry).
7. Inclusion of climate change issues in curriculum at secondary and tertiary educational institution.
8. Enhancing resilience of urban infrastructure and industries to impacts of climate change.
9. Development of eco-specific adaptive knowledge (including indigenous knowledge) on adaptation to climate variability to enhance adaptive capacity for future climate change.
10. Promotion of research on drought, flood and saline tolerant varieties of crops to facilitate adaptation in future.
11. Promoting adaptation to coastal crop agriculture to combat increased salinity.
12. Adaptation to agriculture systems in areas prone to enhanced flash flooding in North East and Central Region.
13. Adaptation to fisheries in areas prone to enhanced flooding in North East and Central Region through adaptive and diversified fish culture practices.
14. Promoting adaptation to coastal fisheries through culture of salt tolerant fish special in coastal areas of Bangladesh.
15. Exploring options for insurance and other emergency preparedness measures to cope with enhanced climatic disasters.

The highest priority project, on coastal afforestation, has been approved for funding through UNFCCC via the Global Environment Facility (GEF) while others, such as mainstreaming adaptation to climate change into sectoral policies and programmes are being targeted through existing initiatives such as the DFID funded Climate Change Cell of the Comprehensive Disaster Management Programme.

Until recently, Bangladesh did not have a climate change strategy or plan, but rather a wide variety of measures implemented as part of key policies in Bangladesh that had the potential to reduce vulnerability to climate change.

Until recently, Bangladesh did not have a climate change strategy or plan, but rather a wide variety of measures implemented as part of key policies in Bangladesh that had the potential to reduce vulnerability to climate change (Tanner et al, 2007). In 2008, in preparation for the UK-Bangladesh Climate Change Conference the Bangladesh Government came up with the Bangladesh Climate Change Strategy and Action Plan (BCCSAP). Although the process of formulation of the BCCSAP has been highly contested, the approach adopted in this 'living document' is one that can serve as an example to many other LDCs. The BCCSAP is based on six major pillars (MoEF, 2008):

1. Food security, social protection and health: to ensure that the poorest and the most vulnerable in the society are protected from climate change and that all programmes focus on food security, safe housing, employment and access to basic services including health
2. Comprehensive disaster management: to strengthen the disaster management systems to deal with increasingly frequent and severe natural calamities
3. Infrastructure: to ensure that existing assets are well maintained and fit for purpose and infrastructure needed to cope with the impacts of climate change is put into place
4. Research and knowledge management: to predict the likely scale of impacts on different sectors of the economy and socio-economic groups
5. Mitigation and low carbon development: to evolve low carbon development options and implement these over the coming decades
6. Capacity building and institutional strengthening: strengthening to enhance the capacity of government ministries and agencies, civil society and the private sector to meet the challenge of climate change.

The BCCSAP lists 37 programmes under the 6 major pillars which are to be reviewed and revised as more knowledge and experience is gained over time while implementing adaptation and research related programmes. Each of the programmes description only includes: the justification, the kind of activities to be undertaken and the responsible ministry/agency, these programmes are to be elaborated on in consultation with the stakeholders at the time of their implementation.

The Government of Bangladesh has developed a number of sectoral policies and plans since the 1990s. Considering the fact that Bangladesh is highly susceptible to climate change, only one sectoral policy on the Coastal Zone, has considered climate change. The National Water Policy (NWP) announced in 1999, is the first comprehensive look at short, medium and long term perspectives for water resources in Bangladesh. The NWP was followed by the National Water Management Plan (NWMP) in 2001. Given the critical effects of climate change on water resources in Bangladesh, it is important

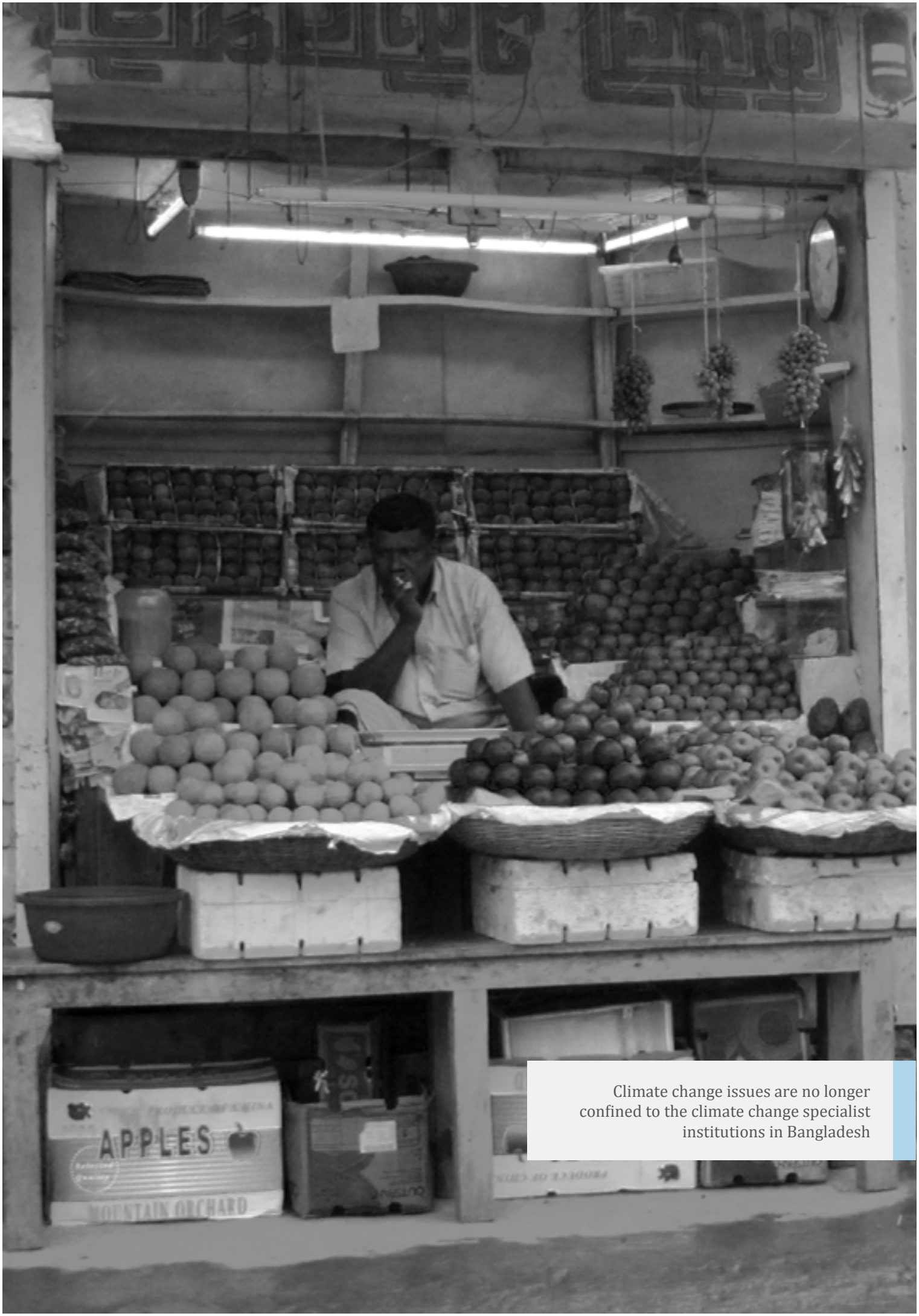
to note that the NWP does not mention this issue at all. However, the NWMP recognizes climate change as one of the future factors affecting supply and demand of water. The National Environmental Management Action Plan (NEMAP), which was published in 1995, does not discuss climate change. Similar to NEMAP, the National Land Use Policy (NLUP) and the National Forest Policy (NFoP) does not make direct reference to climate change. Until recently, climate change was not addressed in the Poverty Reduction Strategy (PRS) Papers either. The current PRS recognizes the threat of climate change and the adverse impacts it can have on our development process. It understands the need for integration/mainstreaming of adaptation measures into other policy areas and the implementation of the adaptation projects identified in the NAPA. All these sectoral policies show that even though the potential to reduce the vulnerability to climate change exists in them, it is not being recognized and therefore implemented.

A brief review of a few relevant national policies in the main climate sensitive sectors demonstrates that climate change issues are neither assessed nor tackled in a strategic or routine manner. The recent emergence of climate change issues, low levels of scientific capacity and awareness about climate change processes and impacts in Bangladesh, an international focus on greenhouse gas emissions reduction rather than adaptation to the impacts of climate change, its treatment as a predominantly environmental issue, and the long timescales used in the analysis of impacts are factors responsible for this lack of integration of climate change issues into other sectors.

A brief review of a few relevant national policies in the main climate sensitive sectors demonstrates that climate change issues are neither assessed nor tackled in a strategic or routine manner.

The government established a Climate Change Cell (CCC) to build capacity and to mainstream climate change issues to promote climate-resilient development in Bangladesh in 2004. The CCC is supported by DFID through the Comprehensive Disaster Management Programme (CDMP). "This was undertaken as part of the shift in disaster management practices towards preparedness and risk reduction rather than relied efforts" (Tanner et al, 2007:21). The CCC is housed within the Department of Environment (DoE) which is the technical arm of the National Focal Point on climate change issues i.e. the Ministry of Environment and Forest (MoEF). The CCC has tried to establish links among the sectoral agencies and prepared a common knowledge base for NGO efforts on CC related issues. "The CCC has now taken a coordinated role to establish 'focal points' in each development sector (including ministries and their respective technical/planning and implementing agencies)" (Tanner et al, 2007:21). Based on the recently completed community-based adaptation project "Reducing Vulnerability to Climate Change" (RVCC) the CCC is developing related guidelines for the emerging Community Risk Assessment process developed under the CDMP (CDMP, 2006). The aim is to develop a uniform methodology for all vulnerable areas and to complete resulting bottom-up Climate Change Risk Reduction Plans (CCRRP) so as to enable efforts at the lowest tier of government to be integrated with efforts to tackle climate change (Tanner et al, 2007:22).

Climate change issues are no longer confined to the climate change specialist institutions in Bangladesh, for example, the Department of Environment (DoE). It is now a multi-disciplinary and multi-ministerial issue within the government (Huq, 2009: Personal communication). A big practical break



Climate change issues are no longer confined to the climate change specialist institutions in Bangladesh

Photo credit:AIT-UNEP RRC.AP/Roopa Rakshit

in mainstreaming climate change adaptation issues came in the form of the Comprehensive Disaster Management Programme (CDMP), which started off being a very traditional disaster management programme and into which climate change components were incorporated. "Disaster risk reduction offers opportunities for "bottom-up" strategies for adaptation to current climate variability and climate extremes" (Climate Change Cell, 2008:8).

The Mission of the Ministry of Food and Disaster management is "to bring a paradigm shift in disaster management from conventional response and relief to a more comprehensive risk reduction culture and to promote food security as an important factor in ensuring the resilience of the communities to hazards"

The Goal of Bangladesh's disaster risk reduction policy is "to contribute to sustainable development through reducing the burden of disasters on the poor and most vulnerable". The Mission of the Ministry of Food and Disaster management is "to bring a paradigm shift in disaster management from conventional response and relief to a more comprehensive risk reduction culture and to promote food security as an important factor in ensuring the resilience of the communities to hazards" (Climate Change Cell, 2008:8). The CDMP demonstrates a process through which a country like Bangladesh can integrate and address climate related risks and disasters within a comprehensive management framework. The CDMP framework is built from an assessment of risks at community level through sector and cross sectoral analysis, macro-country analysis of temperature variations; monsoon rainfall, sea level rise, etc. are also taken into consideration (Climate Change Cell, 2008).

Listed below is a brief description of each of the Ministries and Sectors and their contribution towards adapting to climate change:

The **Ministry of Environment and Forests** is the Climate Change Focal Point and responsible to comply under the decisions of the UNFCCC and KP. They are responsible for the preparation of national communication, formulation of national adaptation programme of action, providing approval for CDM projects, attending international negotiations and facilitating mainstreaming at the sectoral level.

The **Ministry of Planning** is responsible for facilitating overall midterm and perspective planning. It also supports sectoral planning and provides guidance. The General Economic Division of the Planning Commission has initiated a process to enhance institutional capacity of the GED to facilitate climate change in the planning perspective.

The **Ministry of Finance** is responsible for Budget allocation. This is the first time that government has allocated resource to deal with adverse impacts of climate change from national budget.

Ministry of Health/DG-Health has to lead countrywide diseases surveillance, ensure adequate availability of Ambulance, Medicine, Vaccine, Surgical Equipment etc. in the Thana Health Centres of disaster prone areas.; educate people about health care through radio, television, newspaper and other media during floods and after cyclones; establish temporary hospitals and cyclone shelters to meet the emergency needs and ensure active participation in the meeting of Inter-Ministerial Disaster Management.

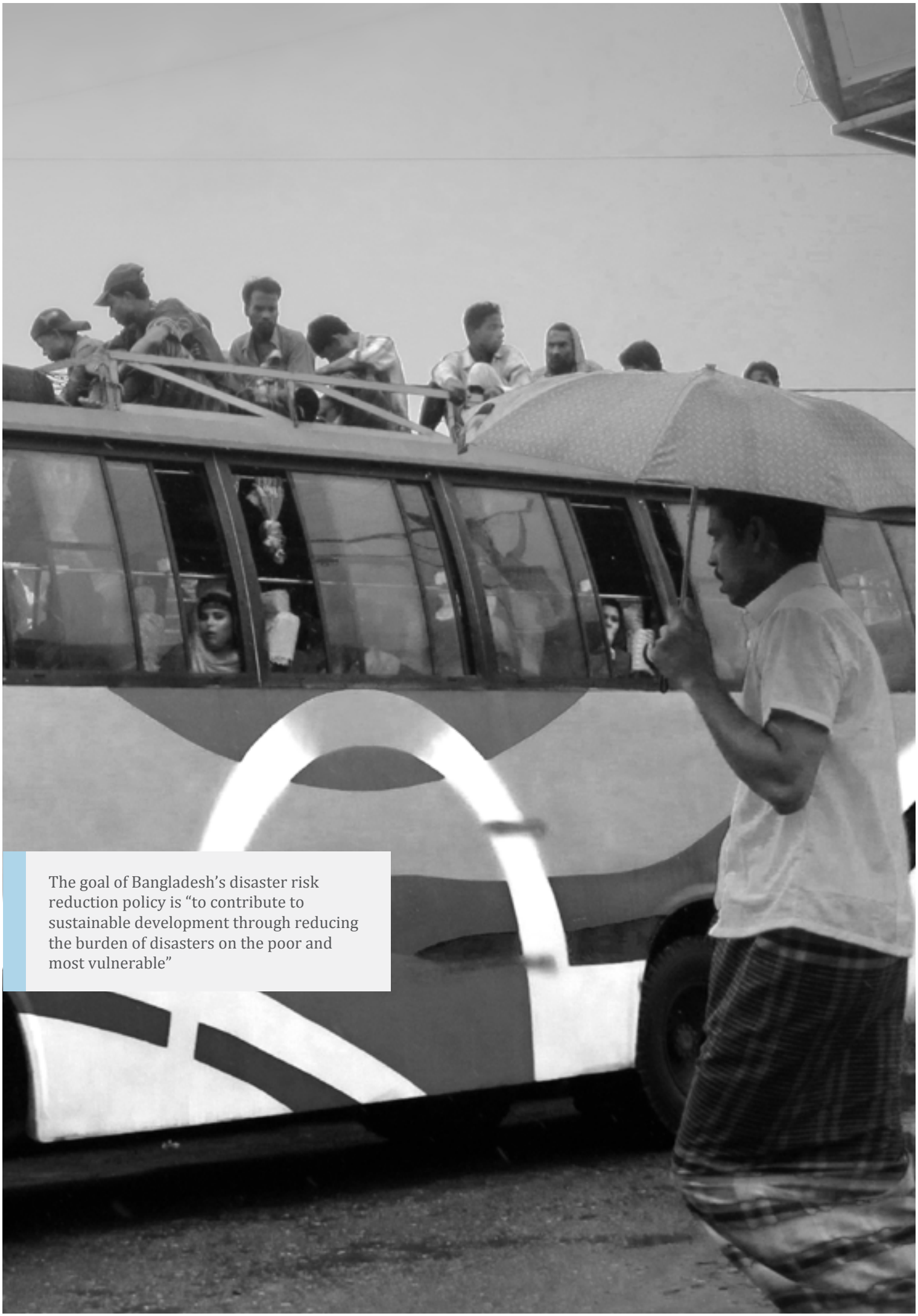
The **Bangladesh Meteorological Department (BMD)** is responsible for watching over weather conditions, and ensures improvement of cyclone forecast procedures and supply of information on regular basis. They ensure full time effectiveness of the quickest channel of communication for disseminating weather warnings to all concerned. Fax arrangement must be established between SWC of Meteorological Department and Radio, Television and the Ministry of Food and Disaster. Prepare and submit Special Weather Bulletin and broadcast/publicize the same through national news media such as the all stations of Radio and Television and in national newspapers for the benefit of the general people.

Ministry of Food and Disaster Management has to deal with natural disasters and ensure availability of food at country level. The Action Plan of the Ministry on disaster management is reviewed every three months. They are responsible for the identification of the disaster prone Thanas and areas and the population likely to be affected by the disaster. Update the list of foreign and private agencies willing to participate in the disaster preparedness, emergency response and rehabilitation programmes. Arrange meetings of the National Disaster Management Council and Inter-Ministerial Disaster Management Coordination Committee to assess the disaster preparedness of different Ministries, agencies, departments, local governments, autonomous bodies, CPP, Red Crescent, NGOs, etc.

Ministry of Water Resources/Bangladesh Water Development Board: The Flood Forecasting and Warning Centre (FFWC) of Bangladesh Water Development Board will act as Focal Point and the Deputy Director in Charge of the Centre will act as Liaison Officer. They are responsible for the construct of embankments in disaster prone coasts and islands according to designs approved by the government; undertake operation of sluice gates and other water discharging devices in completed embankment areas; monitor continuously the condition of the embankment and repair the breaches and weak points in adequate manner and operate the Flood Forecasting and Warning.

The Ministry of Agriculture, Bangladesh Rice Research Institute (BRRI), Bangladesh Agricultural Research Council (BARC) and Bangladesh Agricultural Research Institute (BARI) are responsible for carrying out research on the development of different crop varieties resilient to different climate stresses. They are to arrange for keeping stocks of seeds, fertilizers and insecticides; training of various levels of officers for participation in different steps of cyclone preparedness activities; allocation of funds for the purchase and distribution of seeds and fertilizers; and the implementation of post disaster relief operations.

Ministry of Information is responsible for the popularization of the techniques for preparedness and survival during pre-disaster, disaster and post-disaster period including leaflets/booklets supplied by the Disaster Management Bureau and concerned Ministry through television, Radio and other publicity media. They are to arrange wide publicity with the help of mass media about the cyclone and flood warning signals with necessary explanations; ensure strict performance of the allotted duties by Radio, Bangladesh Television, News Media, Press Information Department, Mass Communication Department and



The goal of Bangladesh's disaster risk reduction policy is "to contribute to sustainable development through reducing the burden of disasters on the poor and most vulnerable"

Photo credit: AIT-UNEP RRC.AP/Roopa Rakshit

Films and Publications Department/normal times and specially during cautionary / warning and disaster stages.

Ministry of Local Government, Rural Development and Cooperatives, and its associated organizations are responsible to encourage local government agencies for building roads, bridges and culverts for communication to cyclone shelters and growth centers; advise people to keep the foundations of their residence above flood level; prepare maps showing population concentration and deep wells, protected pond and other sources of drinking water; ensure reserve stock of tube wells and spare parts; ensure availability of drinking water at times of need; direct local government institutions for extending assistance to the Deputy Commissioner and the Thana Executive Officer for rescue and relief operations; ensure availability of repair workers for emergency repair of damaged tube wells in affected areas and send technicians from unaffected areas to the affected areas.

Bangladesh Institute of Development Studies (BIDS) has recently started to research on climate change related issues along with research on economic development, population studies, human resources and social sciences related to planning (BIDS, 2006).

Bangladesh Centre for Advanced Studies (BCAS) is an independent policy, research and implementation institute working on sustainable development (BCAS, 2002) and implementation of projects related to climate change and climate variability issues.

The existing state of knowledge and existing initiatives related to adaptation and obvious sectors such as disaster management.

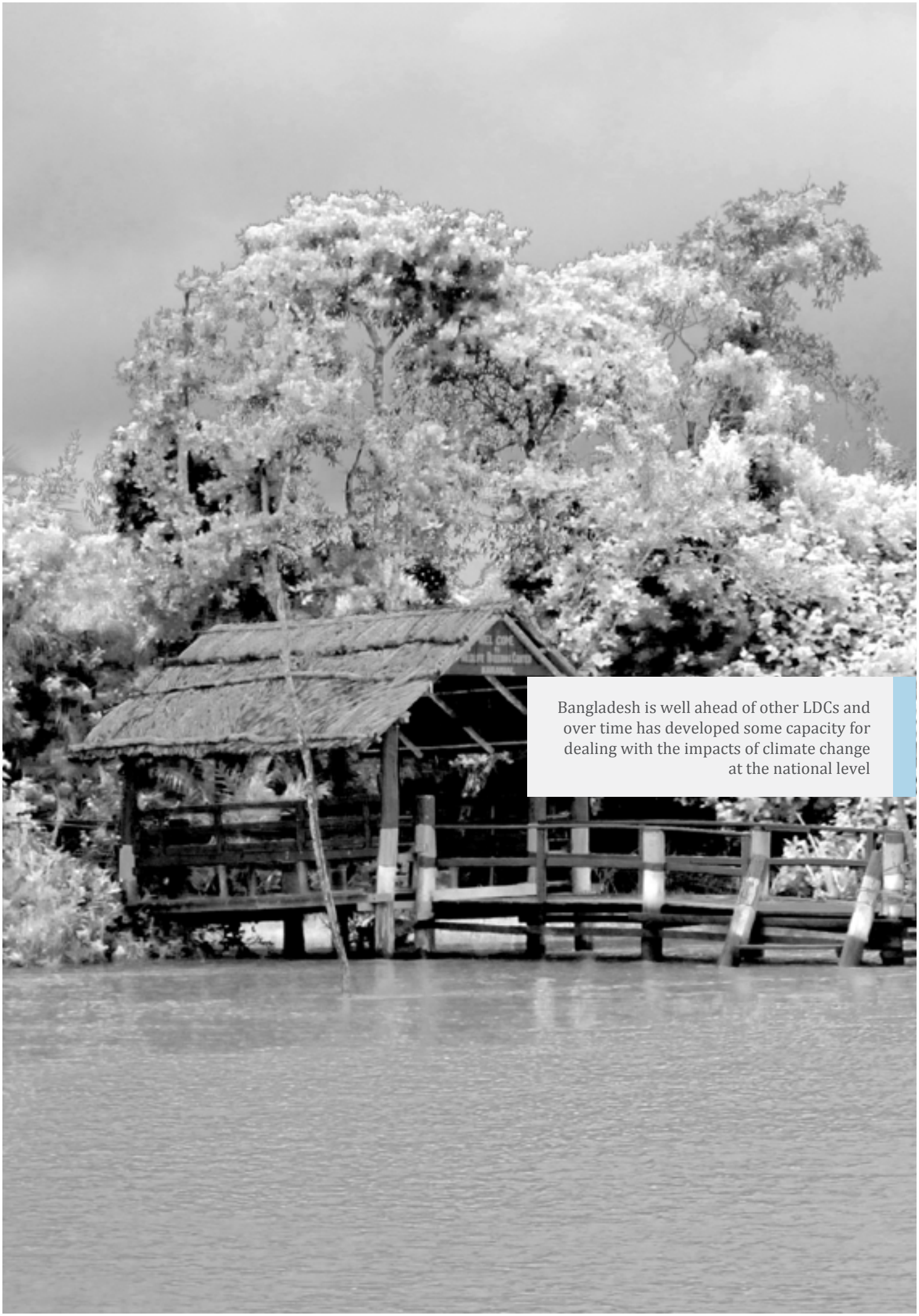
In recent years a number of international agencies and development partners/donors including GEF, DFID/British High Commission/British Council Bangladesh, United Nations Development Programme (UNDP), Danida/Embassy of Denmark, EC-Bangladesh, JICA, NL, World Bank, Asian Development Bank have become active in supporting both adaptation and mitigation.

In Bangladesh, awareness to climate change occurred much earlier compared with other developing and even developed countries, however, “there is a striking lag between awareness and policy-level action” (Ayers & Huq, 2009:759). “One reason for the leadership of Bangladesh among the other LDCs is the history of environmental research and NGO action in Bangladesh, largely as a result of its extreme environmental vulnerability; the climate change agenda gave research and NGOs another focus, and the institutional framework was already there to be mobilized” (Ayers & Huq, 2009:759). Secondly, the civil society in Bangladesh has been more active than anywhere else, “the big breakthrough came about in Bangladesh because of the civil society based efforts who have taken up climate change in a very big way, bigger than anywhere I’ve ever seen” (Huq, 2009: Personal communication).

Despite endless efforts from the earliest stages of climate change activity to sensitize all sectors of Bangladesh, it has drawn limited attention from the policy-making communities, a confusion of incentives and institutional mechanisms did not allow it to be as effective as it had been envisioned

Brief of some of the recent adaptation projects (BCAS, 2007):

1. National Adaptation Programme of Action to Climate Change (2005) - This project was implemented by Ministry of Environment and Forests in association with other relevant government and non-government organizations. It was funded by GEF through UNDP. 15 Priority Projects were identified under NAPA in 6 major sectoral clusters including areas covering agriculture, water, forestry, fisheries, livestock, infrastructure, communication, industry, health and socio-economic aspects among others).
2. Climate Change and Disaster Risk (2006-2007)- It was on screening of DFID –Bangladesh Portfolio. It was funded by DFID Bangladesh with some support from DFID London.
3. Climate Change Cell (2004-2009) – currently supported under Comprehensive Disaster Management Programme (CDMP) of the Ministry of Food and Disaster Management of the Government of Bangladesh. This project was funded by DFID. DFID supported to establish the Climate Change Cell (CCC) under the Ministry of Environment and Forests. Current support focuses on adaptation and includes work on modelling, research, cross-ministerial coordination and inputs to community risk assessment processes being carried out by CDMP.
4. Chars Livelihoods Programme (2004-2010)- A programme working in Jamuna chars on a range of livelihoods support activities. DFID supported to implement this project.
5. Structured consultation on a Climate Change Strategy and Action Plan for Government of Bangladesh (2007-2008): Dept of Environment/CCC is leading the process of developing a climate change strategy through a process of wide consultation. DFID is providing funds for the consultation sessions.
6. Economic Empowerment of the Poorest Challenge Fund (2008 -2015)- Challenge fund for NGOs targeting the extreme poor – to help them lift themselves out of poverty. Climate Change adaptation measures will be fully integrated. This project is still under process to be implemented in coastal and haor regions of the country. DFID will be funding this project.
7. Community based Adaptation to Climate Change through Coastal Afforestation (2007-2010) - NAPA follow-up implementation of the 1st project. The goal of the project is to reduce vulnerability of coastal communities to impacts of climate change. In this respect, the project objective is resilience of coastal populations, settlements, and ecosystems in areas exposed to coastal hazards improved). This project is going to be funded by LDCF/ GEF through UNDP.
8. Community-Based Adaptation (CBA) Programme under CDMP (2007-2009) - Project interventions are in line with national priorities, especially with respect to vulnerability and/ or adaptive capacity development of local communities. The National Steering Committees involved will acquire the appropriate expertise to be able to address adaptation projects as part of their customary activities.) This project is going to be funded by again GEF through UNDP.
9. Climate Management Plan for the Agricultural Sector (2008)- Assist GoB partners in conducting a climate screening and develop a climate management plan for the Agricultural Sector, taking outset in the GoB-Danida Agricultural Sector Programme Support, Phase II-ASPS II), funded by Danida.
10. EC Support to NAPA implementation (2008-2012)- This project is still under process to implement one or more of the priority projects identified under NAPA. This will be funded by EC-Bangladesh.
11. Comprehensive Disaster Management (CDMP-II). This project will implement climate change related components during 2009-2014. It is still under process and will be funded by EC and DFID.



Bangladesh is well ahead of other LDCs and over time has developed some capacity for dealing with the impacts of climate change at the national level

Photo credit:AIT-UNEP RRC.AP/Roopa Rakshit

(Ahmed, 2004; Ayers & Huq, 2009). "While national priorities favoured widespread adaptation action, the international focus until recently (particularly with regard to funding) had been on mitigation, meaning that government incentives lay primarily in mitigation" (Ayers & Huq, 2009:759). Decisions at the international level play significant roles in developing national policies and programmes (Alam & Rahman, 2008). This led the Bangladesh government to carry out much mitigation activity and research between 1993 and 2002 (Ayers & Huq, 2009).

However, unlike other poor countries, the Bangladesh government, scientific and civil societies are aware of the changes taking place and are trying to work towards reducing the impacts of these effects. The Bangladesh government has started to integrate climate change into sectoral plans and national policies such as the Poverty Reduction Strategy Paper (PRSP) and was the first of the LDCs to complete their NAPA (Reid et al., 2007; Ayers & Huq, 2009). Bangladesh is well ahead of other LDCs and over time has developed some capacity for dealing with the impacts of climate change at the national level; policy responses are also being mobilized that deal with vulnerability reduction to climate change, for example, the recently formulated BCCSAP (Huq & Ayers, 2008).

RESEARCH PRIORITIES (WHICH REFLECTS BOTH KEY KNOWLEDGE GAPS AND KEY DEVELOPMENT NEEDS AND PRIORITIES)

From the extensive research conducted during the UK Collaborative on Development Science (UKCDS) funded pilot project – Pilot Framework for Collaboration on Research on Climate Change and the Land, Water and Food interface in Bangladesh – carried out by IIED, it was more clearly determined that no broadly accepted research agenda exists in Bangladesh (IIED, 2009). Both the BCCSAP (MoEF, 2008) which is now being revised and the NAPA (MoEF, 2005) offer some guidance but focus more on action rather than research priorities.

The Bangladesh Climate Change Strategy and Action Plan (BCCSAP) mentions 'Research and Knowledge Management' as one of its six pillars but does very little to expand on the idea. A brief one line description can be found on the BCCSAP which says research and knowledge management can be used to predict future events, reduce the impact of climatic changes on our economy and introduce Bangladesh into the latest global networks thinking about climate change (MoEF, 2008). However, the establishment of a comprehensive research agenda for Bangladesh was never given enough importance by the government. A detailed study of the work being done in the field of climate change adaptation in Bangladesh by the government, scientific community and civil society shows that research undertaken is not well coordinated and does not serve any purpose.

The current situation of climate change adaptation research:

- Climate change is currently a high profile issue for Bangladesh, with national representatives deeply engaged in international mitigation and adaptation negotiations. Bangladesh was one of the first Least Developed Countries to complete its National Adaptation Programme

of Action (NAPA) which eventually led them to create the BCCSAP in 2008. Bangladesh is already a world leader in the research, design and implementation of adaptation strategies (MoEF, 2008). However, the BCCSAP has met with widespread criticism from the civil society for being a top-down approach which lacked proper consultation with the stakeholders involved and was rejected by both national and international societies for not taking into consideration public opinions. It has also met with criticisms for being a poorly detailed plan and only covering the six areas it mentions vaguely by making a list of programmes the government intends to carry out. The BCCSAP fails to mention the roles of the stakeholders other than the government, only mentioning that the government will involve NGOs when needed. Another major concern about the BCCSAP has been that it focuses too much on 'infrastructure' and too little on 'adaptation' itself. Researchers are unhappy with the document as it completely disregards the importance and need for more research to understand how Bangladesh will be affected by future climatic changes.

- The Bangladesh adaptation research landscape includes a wide range of actors, the civil society, NGOs and government funded research institutes are prominent in the field of climate change adaptation. A few public and private universities are also involved in such research.
- Reducing Vulnerability to Climate Change (RVCC) project was a pioneering action-learning project, carried out by CARE-Bangladesh along with BCAS, and Bangladesh Rice Research Institute (BRRI). It was immensely successful and is known as one of the earliest projects which aimed to integrate climate change adaptation into day-to-day activities carried out by the poor and vulnerable. The three year project, carried out in the south-western region of Bangladesh, promoted and tested strategies and technologies to reduce the vulnerabilities of the poorest to extreme weather events. Also, allowing them to evolve through the course of the project. The project contributed knowledge to a range of issues related to local adaptation including: the uptake of salt tolerant rice varieties (in collaboration with BRRI) and other crops and drought resistant crops; approaches to livestock rearing in the context of regular flooding; reduced health impacts of flooding through sanitary latrines; development of rainwater harvesting systems and other technologies for improved access to safe drinking water; development of adaptations to housing construction to make it more resistant to storms. Action Aid Bangladesh, Practical Action and IUCN-B are now involved in implementing with their local partners community based action-adaptation projects which seek to introduce, implement and understand various climate change adaptation measures modified in consultation with the locals.

Major focal areas for research have included local level response to climate change; agricultural impacts and responses such as crop adaptations; and the health impacts of floods, droughts and disasters.

- There are a few actors who have been involved in climate change adaptation for a long time, for example, Bangladesh Centre for Advanced Studies (BCAS) and the Centre for Environmental and Geographical Information Systems (CEGIS), most other NGOs and government institutes have only recently started to integrate climate change adaptation into their research agendas.
- "Major focal areas for research have included local level response to climate change (including several participatory projects led by NGOs); agricultural impacts and responses such as crop adaptations; and the health impacts of floods, droughts and disasters" (IIED, 2009:8).

Table1 Research priorities on climate change in the land, water and food interface in Bangladesh (IIED-UKCDS, 2009)

Research objective	Research priorities			
	Land-water interface	Food and agriculture	Health and nutrition	Livelihoods
Understanding land and water trends that will affect adaptation	Ongoing modelling of future climate scenarios: sea level rise, impacts on river flows, storm surge, temperature, rainfall patterns, glacial melt Model validation and calibration			
Assessing the secondary physical impacts and risks	Flood and drought probabilities, risks and impacts Effects on biodiversity and ecosystems (at regional and local levels)			
	Effects of land and water changes on food security			
	Impacts on transboundary water flows Effects on crops and livestock, including on pests and diseases Effects on fisheries Effects on disease patterns and prevalence			
Assessing impacts on human populations	Vulnerability, impact and risk assessments for all key areas, differentiated by social groups (e.g., gender, wealth) Macroeconomic impacts, sectoral cost-benefit analyses (health, agriculture, WRM, infrastructure)			
	Impacts on water resource management options and strategies			
	Impacts on development programmes and interventions			
			Understanding links between cc, poverty and health	Understanding the differential impacts on the vulnerability of the poor, esp. the landless Understanding the impacts on livelihood strategies and settlement patterns
Developing responses	Adaptation of infrastructure design standards	Assessing barriers to farmers' understanding of cc and uptake of new practices Development of new crop varieties and agricultural practices	Developing interventions to address vulnerabilities and impacts	Exploration of options (e.g., insurance) for decreasing vulnerability to risk from natural disasters and other cc impacts Development and testing of adaptation technologies and approaches for poor households (action research)
Testing responses		Farmer trials	Health intervention trials	
Assessing impacts of responses			Impacts of adaptation interventions on health (e.g., flood defences and vector-borne diseases)	Social impacts of changes in livelihood strategies and population movements in response to cc
Communicating results				
Using results				
Developing capacity to use results				
Developing capacity to do research				

- Another programme worth mentioning is the Comprehensive Disaster Management Programme (CDMP) which was started in 2003 to advance the risk reduction efforts in the country. CDMP was a strategic, institutional and programming approach that was designed to reduce long-term risks and to strengthen the operational capacities for responding to emergencies and disaster situations including actions to improve recovery from these events (CDMP, 2008). After the success of CDMP I, CDMP II has now been started, to institutionalise the adoption of risk reduction approaches, not just in its host Ministry of Food and Disaster Management but more broadly across thirteen key ministries and agencies.

Review of past and current research experience (IIED, 2009):

During the extensive scoping study it was seen that even when relevant research priorities were established within the specific organisations or with outside collaborators the research funding and the timespan funded for was often too short to produce robust results. As no specific planned research agenda exists, for Bangladesh or for each of these organizations conducting research on various factors contributing or affected by climate change, most of the research done does not fit into the bigger picture. Climate change research has been driven, in many cases, by a researcher's personal interest in a certain field and the availability of funding. Recently, most NGOs have started to link their work to climate change. Many NGOs, both local and international have been doing a lot of work on climate change adaptation without conducting prior research. The understanding of how research can be used to back up a project or an idea is generally weak. IUCN, Action Aid and Practical Action are three international organizations working in the field of *action research* for community-based adaptation to climate change. However, it was seen that they are pursuing their own idea of action research in their own ways.

It was seen from the study that the research results produced are not communicated, disseminated or made available properly. Interest in research is limited amongst the policy makers as many do not understand the importance of linking evidence based research to policy. It has been seen that a lot of research in the areas of how climate change is affecting sectors such as land, water, food, health and nutrition in Bangladesh has been done, but due to the absence of a structured research archive, most of work are highly inaccessible and are mostly not put to use. The idea of dissemination to research to a specific audience is weak. Even when research is done and distributed, the importance of basing future projects on past research is usually not understood.

Provide an overview of existing research and knowledge availability on adaptation issues in the country

"Capacity to use research results varies depending on the type of research and its potential users" (IIED, 2009). The potential users of research of climate change adaptation vary from government agencies, healthcare workers, local governmental officials, farmers and households. Depending on the location and the kind of changes being brought about by climate change in those regions, research results can serve a range of different purposes. However compared to the growing importance being given to research, the capacity to absorb and understand research results has not changed much. Ways in which research results are communicated are also weak and need much improvement.

"The role of climate change science and research in policy-making in Bangladesh is very weak" (IIED, 2009). As is the case in all other countries, and Bangladesh still being an underdeveloped country, policymakers are mostly reluctant to make use of research findings until there is a high level of confidence in them, which is mostly not possible in the case of issues related to climate change. Since policymakers are unwilling or unable to deal with long term findings or scenarios, researchers need to learn how to "translate" climate impact information and knowledge into immediate or short term development problems (IIED, 2009).

To identify priority research issues, this study therefore relied mainly on the priorities identified by key informants in the study carried out by BCAS for the British council and the scoping study carried out by IIED for UKCDS. A national consultation organized by DFID for the development of its own current research programme that produced a general list of climate change research needs (Dalberg 2007; Dalberg 2008) also contributed to the identification of priorities, largely by validating those mentioned by informants.

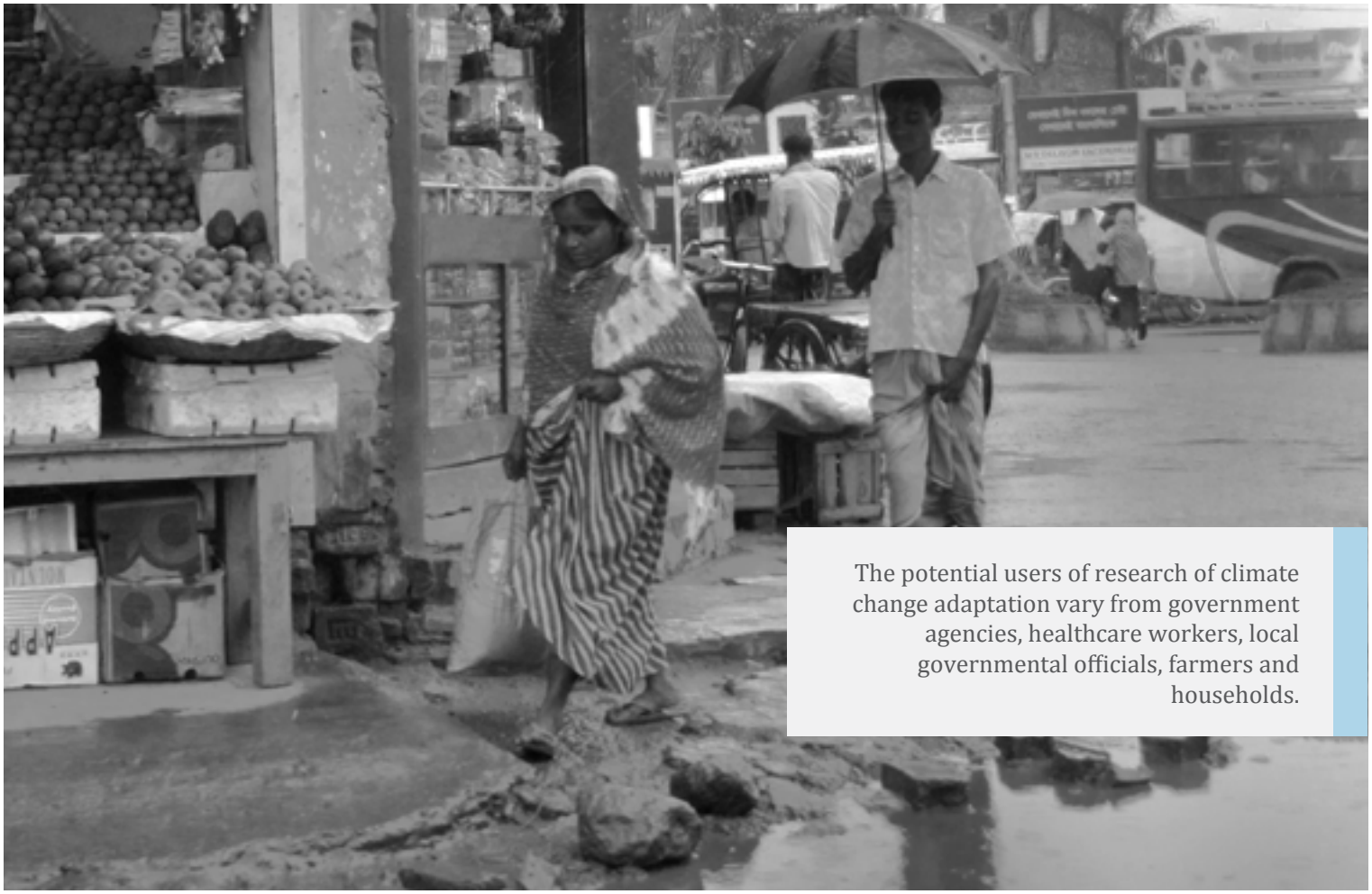
While most informants focused on research priorities within their own disciplines or fields of interest, a generally coherent agenda emerged, indicating a fairly high level of consensus among research stakeholders both in Bangladesh and the UK. This agenda, presented in Table 1, can be ordered around a unifying theme of improved livelihoods, especially for the poor, in the face of climate change (IIED, 2009).

ADAPTIVE CAPACITY NEEDS ASSESSMENT (WHO SHOULD RECEIVE CAPACITY DEVELOPMENT, WHAT TYPES OF CAPACITIES NEED DEVELOPING AND WHAT APPROACHES TO CAPACITY DEVELOPMENT ARE NEEDED)

The adaptive capacity needs assessment can be addressed in two ways: firstly by addressing capacity development in organizations and institutions working towards adapting to the effects of climate change in different regions, localities and social groups in Bangladesh. Secondly, by addressing the capacities that are needed to be developed in each of these communities in different regions affected by varying impacts of climate change.

In Bangladesh, organizations working in the field of climate change adaptation can be categorized in three broad divisions: the government ministries and their respective agencies or research institutes, the scientific community, the civil society and the various international NGOs and donors. While conducting this study, it was clear that the organizations most in need of capacity development were the government run agencies, research institutes and the national universities.

The Bangladesh Agricultural Research Council (BARC) under the Ministry of Agriculture is at the apex of the National Agricultural Research System (NARS). It is responsible to strengthen the national agricultural research capacity through planning the proper use and integration of resources. A few other important research institutes according to their relevance to climate



The potential users of research of climate change adaptation vary from government agencies, healthcare workers, local governmental officials, farmers and households.

change include the Bangladesh Agricultural Research Institute (BARI), the Bangladesh Rice Research Institute (BRRI), the Soil Resources Development Institute (SRDI), Bangladesh Fisheries Research Institute (BFRI), Bangladesh Livestock Research Institute (BLRI) and the Bangladesh Forest Research Institute (BFRI).

These research institutes are important as climate change will affect agricultural productivity of Bangladesh. Bangladesh being a LDC where people's livelihoods depend highly on biophysical resources which are extremely vulnerable, these are the sectors that need to be strengthened if we are to cope with the adverse impacts of climate change. Many of the research institutes, especially BARI and BRRI are already carrying out research and testing new climate resistant varieties of crops. However, for their work to be more effective and useful, it all needs to come under one broad research agenda as stated above. Also, these research institutes are under-equipped to carry out their research, be it their laboratories, or their access to information, to their understanding of the broader picture. For research to be effective, it needs to be accurate, reliable, and it also needs to take the broader picture in mind. It has been seen that the forms of capacity development these research institutes get is in the form of funding for one of their researchers in a foreign university, or a short term funding to buy new laptops for each room. Capacity development needs to be carried out in these institutes in a more basic form, they need to be able to access information needed from peer-reviewed journals and have access to the latest of papers,

The adaptive capacity needs assessment can be addressed in two ways: by addressing capacity development in organizations and institutions working towards adapting to the effects of climate change in different regions, localities and social groups in Bangladesh; and, by addressing the capacities that are needed to be developed in each of these communities in different regions affected by varying impacts of climate change.

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capacity development would mean not only the continuous availability of modern equipment but also changing their ways of thinking, and learning to link their fields to the broader picture.

In Bangladesh another big group involved in working on issues related to climate change are international NGOs, these include: CARE, Action Aid, Oxfam, Practical Action, CARITAS and IUCN. CARE was one of the pioneers on working in the field of climate change adaptation. The reducing vulnerability to climate change (RVCC) project was a three year action learning project in communities in the south western region. The approach was to promote and test strategies and technologies to reduce the vulnerability of the poorest to extreme weather events. These strategies were let to evolve over the course of the project. The project contributed knowledge on a range of issues relevant to local adaptation, including: the uptake of salt tolerant rice varieties (in collaboration with BRRI) and other crops and drought resistant crops; approaches to livestock rearing in the context of regular flooding; reduced health impacts of flooding through sanitary latrines; development of rainwater harvesting systems and other technologies for improved access to safe drinking water; development of adaptations to housing construction to make it more resistant to storms (Ahmed, 2008).

Action Aid Bangladesh has recently started integrating climate change adaptation into their disaster risk reduction programmes. Their project "building community resilience to climate change adaptation and disaster risk reduction" aims to carry out community based action research on climate change adaptation and disaster risk reduction to facilitate communities towards better adaptation for both.

"Mainstreaming livelihood - centred approaches to disaster management" focuses on the roles and linkages between vulnerable communities, district and national level government institutions and humanitarian agencies with regard to disaster preparedness and mitigation.

Practical Action Bangladesh has also followed the same path of integrating climate change adaptation issues into disaster management. A recently completed project "Mainstreaming livelihood-centred approaches to disaster management" focuses on the roles and linkages between vulnerable communities, district and national level government institutions and humanitarian agencies with regard to disaster preparedness and mitigation (Practical Action, 2009). It is clear from these examples that the international organizations have been very successful in mainstreaming climate change adaptation into their regular motives and in terms of capacity building, they would not require much as most of them are the most advanced, in terms of techniques, the people employed and the way the work is carried out.

The other group carrying out climate change research includes research institutes like the Bangladesh Centre for Advanced Studies (BCAS), Bangladesh Institute for Development Studies (BIDS), Centre for Global Change (CGC), Centre for Environmental and Geographic Information Services (CEGIS) and Centre for Natural Resource Studies (CNRS). As mentioned above, all these research institutes are carrying out effective and relevant research in their respective fields of work. However, it has been seen that the research results are mostly stacked away. It would be wrong to say capacity building to communicate research results is not necessary in this field. There needs to be a coherent research agenda that all the organizations agree on and follow, to reduce overlapping and repetition of the same research, increase

effectiveness and increase the linking capacity of the research conducted in the different fields. Research conducted on climate change and its effects on rainfall patterns are also of importance to the field of agriculture and health. Hence capacity needs to be built in the ways the fields and topics of research are co-ordinated, the research results used and communicated. From the study conducted the communication of research results were seen as one of the major barriers to the effective use of research. This is one major area that needs to be built on.

The CDMP II is designed around the following six outcome areas (CDMP, 2008):

Outcome 1: Development of strong, well-managed and professional institutions in Bangladesh that is able to implement a comprehensive range of risk reduction programmes and interventions at the national level, as well as contributing to regional actions, international learning and best practice.

Outcome 2: Reduced risk to rural populations through structural and non-structural interventions, empowerment of rural communities and improved awareness of, and planning for, natural hazard events, including the likely impacts of climate change.

Outcome 3: Reduced risk to urban populations through structural and non-structural interventions, improved awareness of natural hazard events and the piloting of urban community risk reduction methodologies targeting the extreme poor.

Outcome 4: Improved overall effectiveness and timeliness of disaster preparedness and response in Bangladesh by strengthening management capacity and coordination as well as networking facilities at all levels.

Outcome 5: Better disaster-proofing of development funding across thirteen ministries. This will achieved by generating increased awareness of hazard risks and the provision of technical information, advisory services and resources to stimulate positive changes in planning and investment decisions over the long-term.

Outcome 6: Community-level adaptation to disaster risks from a changing climate is effectively managed.

"The Comprehensive Disaster Management Programme (CDMP) was approved by the Bangladesh Government in 2003 as a key strategy to advance whole-of-government and agency risk reduction efforts in the country" (CDMP, 2008). The first phase laid the foundations for institutionalising the risk reduction approaches and frameworks developed through pilot testing. "The CDMP is a strategic, institutional and programming approach that is designed to optimise the reduction of long-term risk and to strengthen the operational capacities for responding to emergencies and disaster situations including actions to improve recovery from these events" (CDMP, Brochure).

The CDMP is now in its second phase, it aims to further reduce Bangladesh vulnerability to climatic changes through risk management and mainstreaming. "CDMP II aims to institutionalise the adoption of risk reduction approaches across the thirteen key ministries and agencies" (CDMP, 2008). The CDMP II aims to improve and create linkages between disaster risk reduction and adaptation to climate change.

Another large project which also intends to mainstream climate change adaptation into its activities is the Chars Livelihoods Programme (CLP). It is one of the largest projects in DFID Bangladesh's portfolio of activities to address extreme poverty in Bangladesh. Working with the poorest households of the Jamuna Chars, the main components of the CLP are:

1. Providing infrastructure
2. Asset building and livelihoods
3. Encouraging social development
4. Offering social protection
5. Promoting Enterprise
6. Heath and Education

The CLP aims to reduce physical vulnerability by building protection from floods, ensuring safe drinking water and sanitation and by creating social protection by providing cash for work. The CLP aims to increase household income by: the asset transfer strategy, micro financial services, by providing a safe place to save and development of the market. It aims to provide social development and social capital, a community safety net and also provide education services (Hodson, 2006).

With regards to climate change adaptation, the CLP 1 interventions could be made more relevant in upcoming CLP 2. The main components of the CLP 1 correspond to climate change adaptation measures that are needed. The CLP 1 aims to provide infrastructure which can easily be made climate proof. Already homestead plinths are being raised for the char dwellers due to the fear of floods. If climate change scenarios are taken into consideration, this strategy can be used for adaptation to climate change as well. The plinths might need to be raised a bit higher if climate change projections are taken into account.

The United Nations Development Programme (UNDP) is also working in Bangladesh on solution to global and national development challenges. UNDP works in the areas of governance, poverty reduction, environment, energy and climate change, disaster management and the achievement of Millennium Development Goals (MDG) (UNDP, 2010). The main clusters that work on areas related to the environment include: Environment and Sustainable Development Cluster, Environment and Sustainable Development Cluster and the Disaster Response and Management Cluster.

Some significant ongoing projects include:

1. Capacity building for the Planning Commission: Poverty, Environment and Climate Change Mainstreaming (PECM)
2. Community based adaptation to climate change through coastal afforestation in Bangladesh
3. Community based adaptation in Bangladesh
4. Comprehensive Disaster Management Programme (Phase II)
5. Poverty, Environment and Climate Mainstreaming

RECOMMENDATIONS

There is a need for more theoretical and research oriented work in the adaptation sector in Bangladesh. Often times, it has been seen that various organizations carrying out and implementing projects and programmes without proper research of the relationship of their area of work and climate change adaptation.

It is critical for Bangladesh at this point to build its human, technological, organisational, scientific and institutional capacity in order to cope with the effects of climate change.

What Bangladesh lacks most is long-term surveillance sites and reliable data records. Without long-term data on the effects of climate change on sectors such as agriculture, water, health, etc. it often becomes a very difficult task to implement futuristic aims. Surveillance sites with proper monitoring equipment and staff need to be set up to record the changes on the various sectors due to the effects of climate change.

Research and the implemented projects have been looking at the short term or acute effects of climate change, however, climate

change will also chronically affect sectors such as agriculture and health, thus more research needs to be carried out on such influences.

Capacity building, as defined by the UN Commission on Sustainable Development (1996:2), "encompasses a wide range of aspects, including the human, technological, organisational, financial, scientific, cultural and institutional...capacity-building is the process and means through which national Governments and local communities develop the necessary skills and expertise to manage their environment and natural resources in a sustainable manner within their daily activities". It is critical for Bangladesh at this point to build its human, technological, organisational, scientific and institutional capacity in order to cope with the effects of climate change.

- More research needs to be carried out based on the various agro-ecological zones or the various ecosystems in Bangladesh; in order for people to cope with the climatic variability it is essential to understand the different effects of climatic changes in different zones.
- Climate change is going to affect the various sectors such as water, land, health, agriculture individually and also as a whole, so when implementing adaptation projects or programmes there needs to be a cross-sectoral and multidisciplinary approach to planning and implementation. To facilitate this process and to be used as a basis, there is a need to develop comprehensive inventory with specific indicators (based on the sectors) to monitor the progress, success and failures of the adaptation programmes. This will clearly help both the government and civil society in the highest body of the decision making system.
- The information and knowledge sharing and dissemination system is very weak in Bangladesh in all the sectors. It has been seen that even through a lot of research is being done, the information sharing system is weak and often much of the research is inaccessible by most people working in the field. People are unaware of the research being done and there is no easy platform to access it.
- A lot of the 'action research' being done by NGOs in Bangladesh could easily be turned into proper peer-reviewed articles if only the research was conducted more thoroughly and documented in a particular style. It has been seen that people in adaptation sector are often unaware of how to write, disseminate and share very useful information and knowledge they have gathered from the field. Workshops allowing people in the field of climate change adaptation to learn how to conduct research, write papers and share them would be very useful.
- Bangladesh's weakness is their incapability to operate and maintain large scale modelling systems and softwares. Capacity building in the field of climate change modelling is a must. There is also a need for understanding the social interpretation of modelling information. There is inadequate understanding and little work being done on the social impacts of climate change and this is a field which needs to be understood clearly for complete adaptation to climate change.

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